Saint Luke's
MID AMERICA HEART INSTITUTE

12 Lead ECG Review

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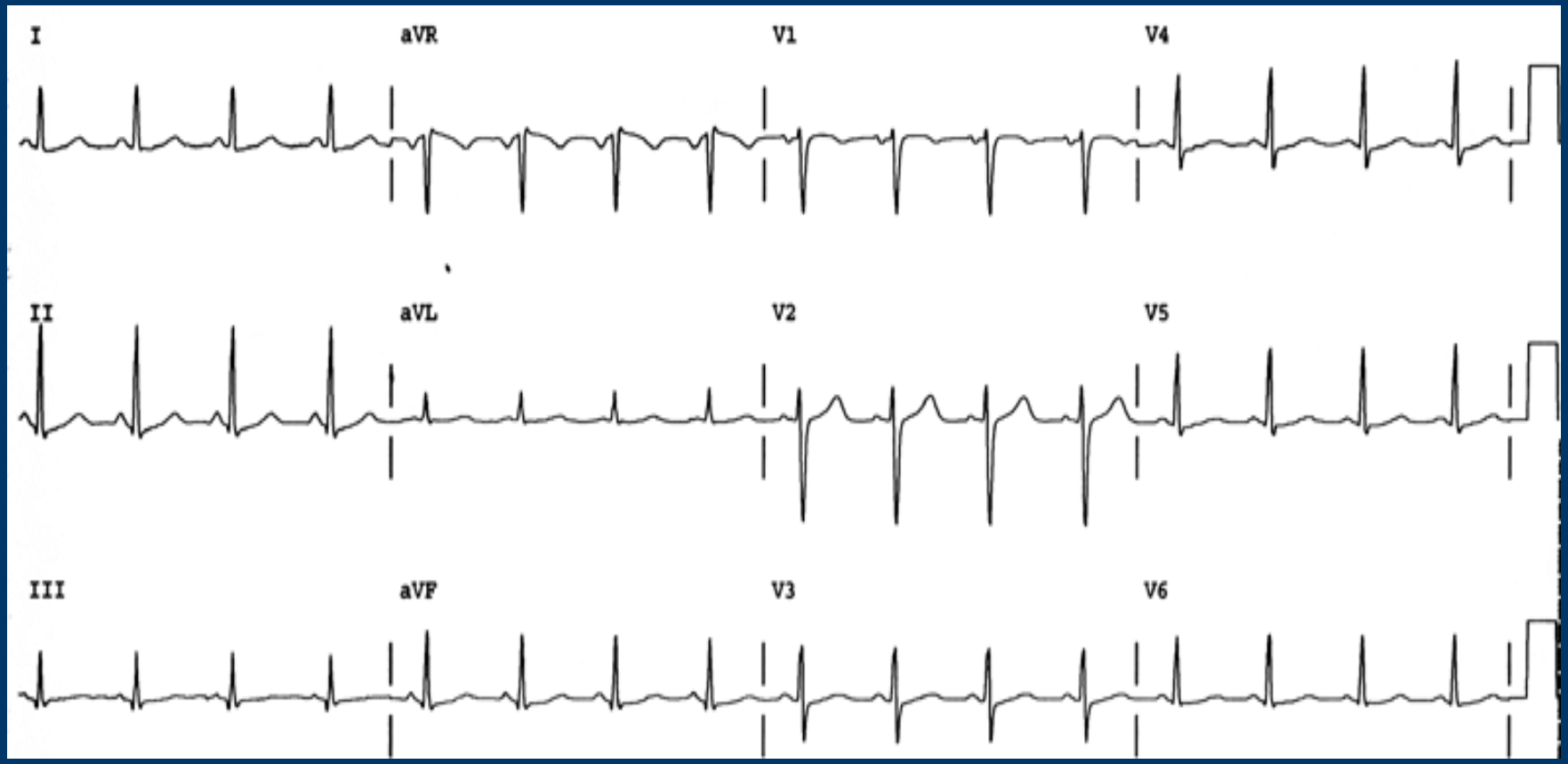
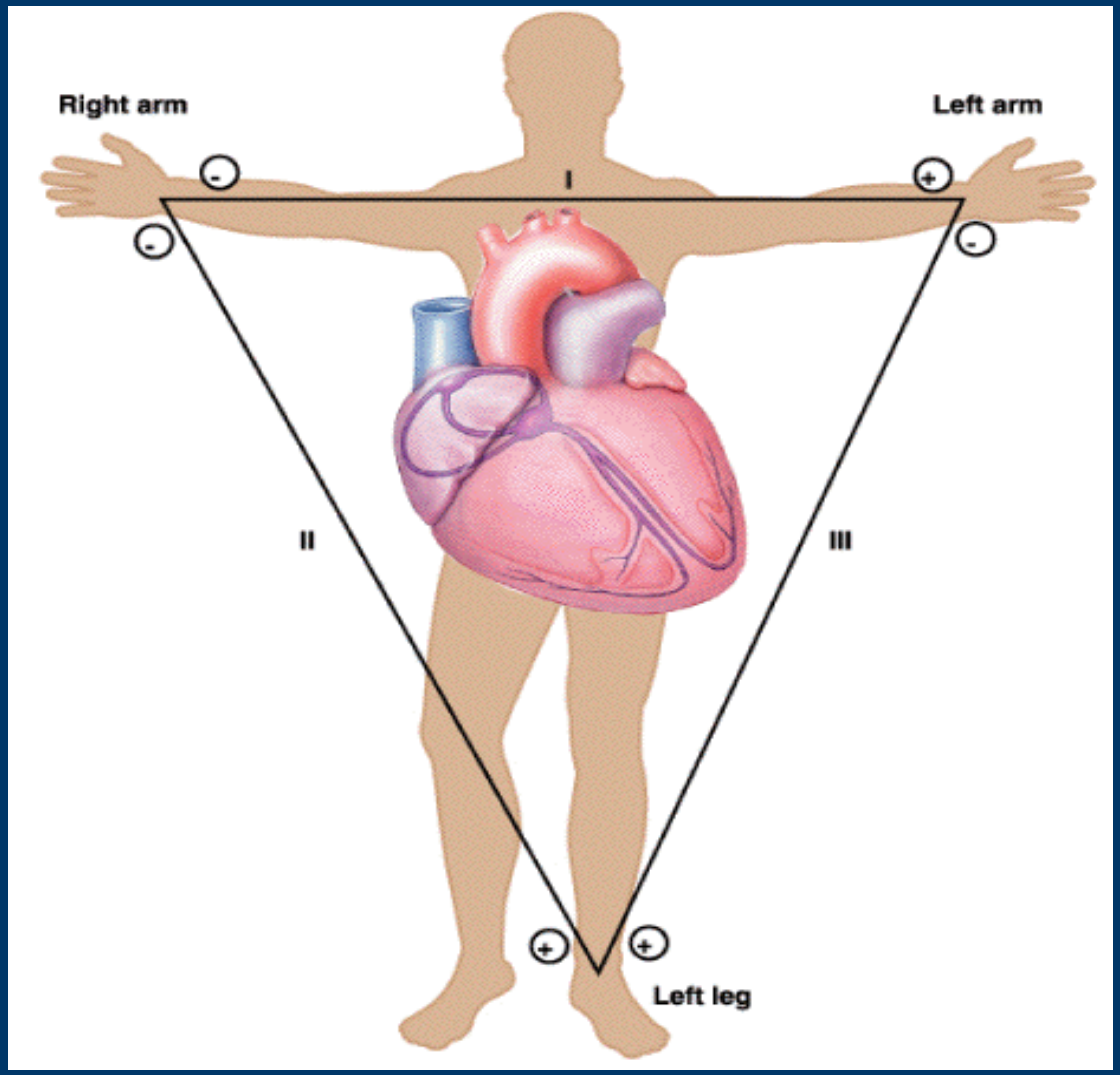
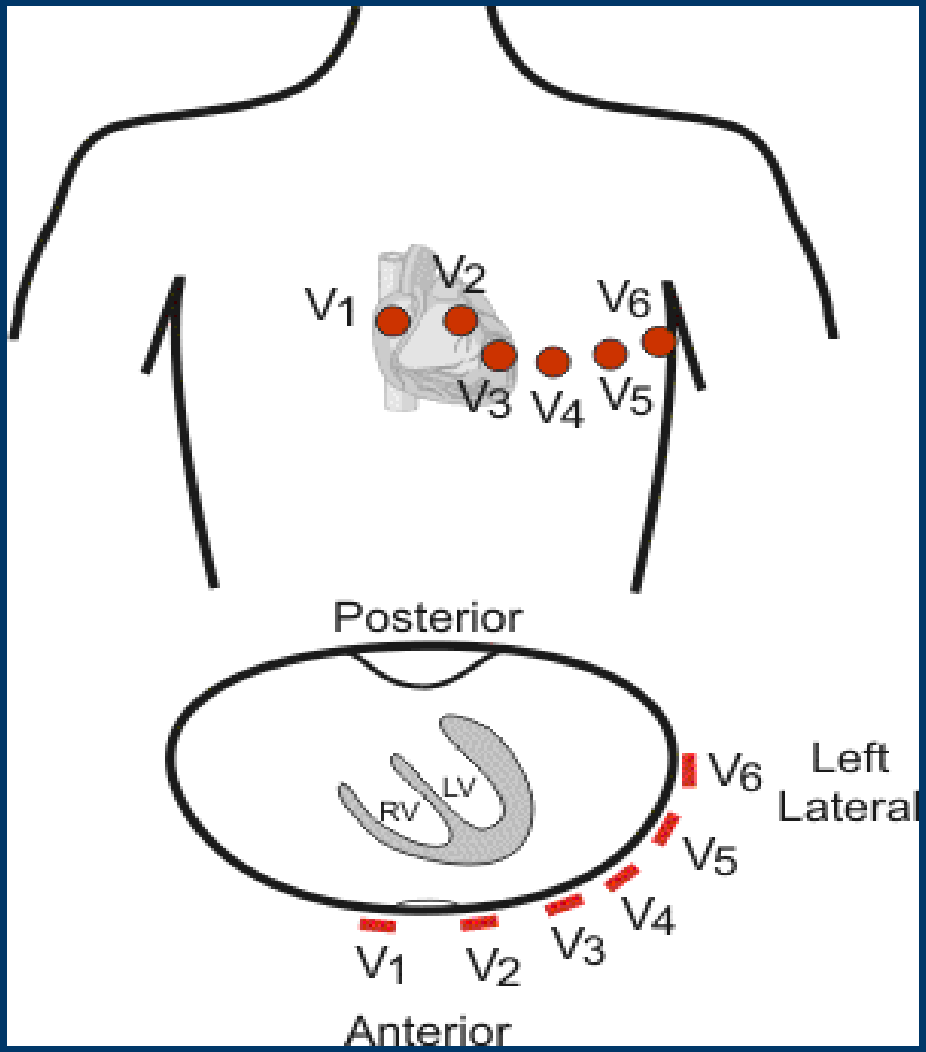
ISCHEMIA & INFARCTION PATTERNS

Normal ECG




Right arm
Left arm
I
II
III
Left leg


V1
V2
V3
V4
V5
V6
Posterior
RV
LV
V6
V5
V4
V3
V2
V1
Left
Lateral
Anterior

Myocardial Areas

I	aVR	V_1	V_4
II	aVL	V_2	V_5
III	aVF	V_3	V_6
Inferior	Septal	Anterior	Lateral

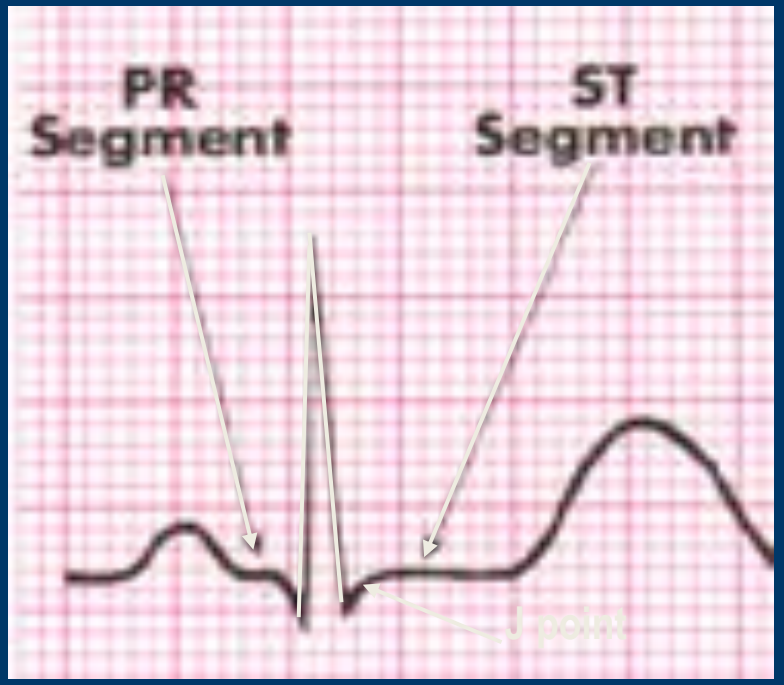
Evolution of an MI

- Direct changes
  - T wave changes - Ischemia
    - Peaked
    - Inverted
  - ST changes - Injury
    - Depression
    - Elevation
  - Q wave develop – Infarction

- Reciprocal changes
  - Opposite of changes in the direct leads
  - Mirror image

ST Segment

- Measure 0.08 sec after the J-point

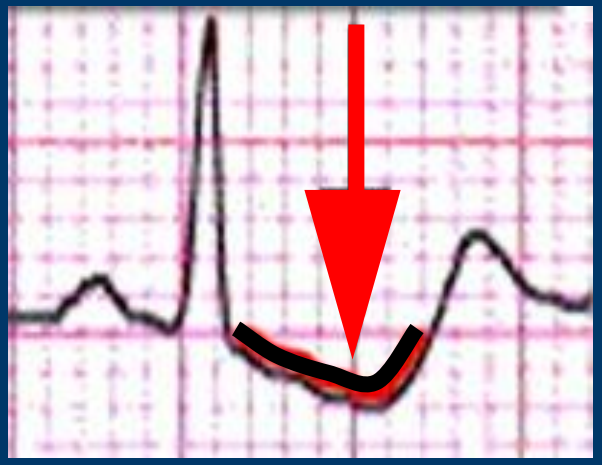


ST Elevation

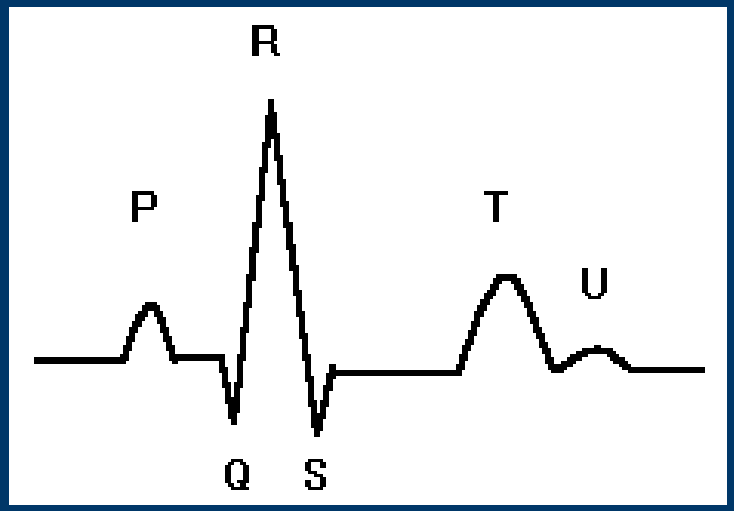
- mm above the isoelectric line

ST Depression

- ST Depression seen in
  - Non-STEMI
  - Reciprocal changes
  - Angina



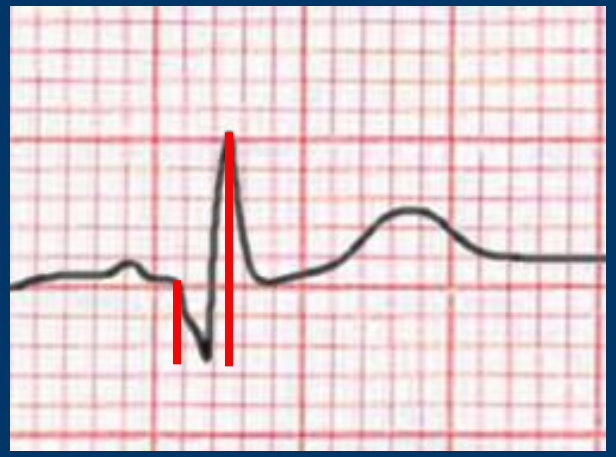
Q wave



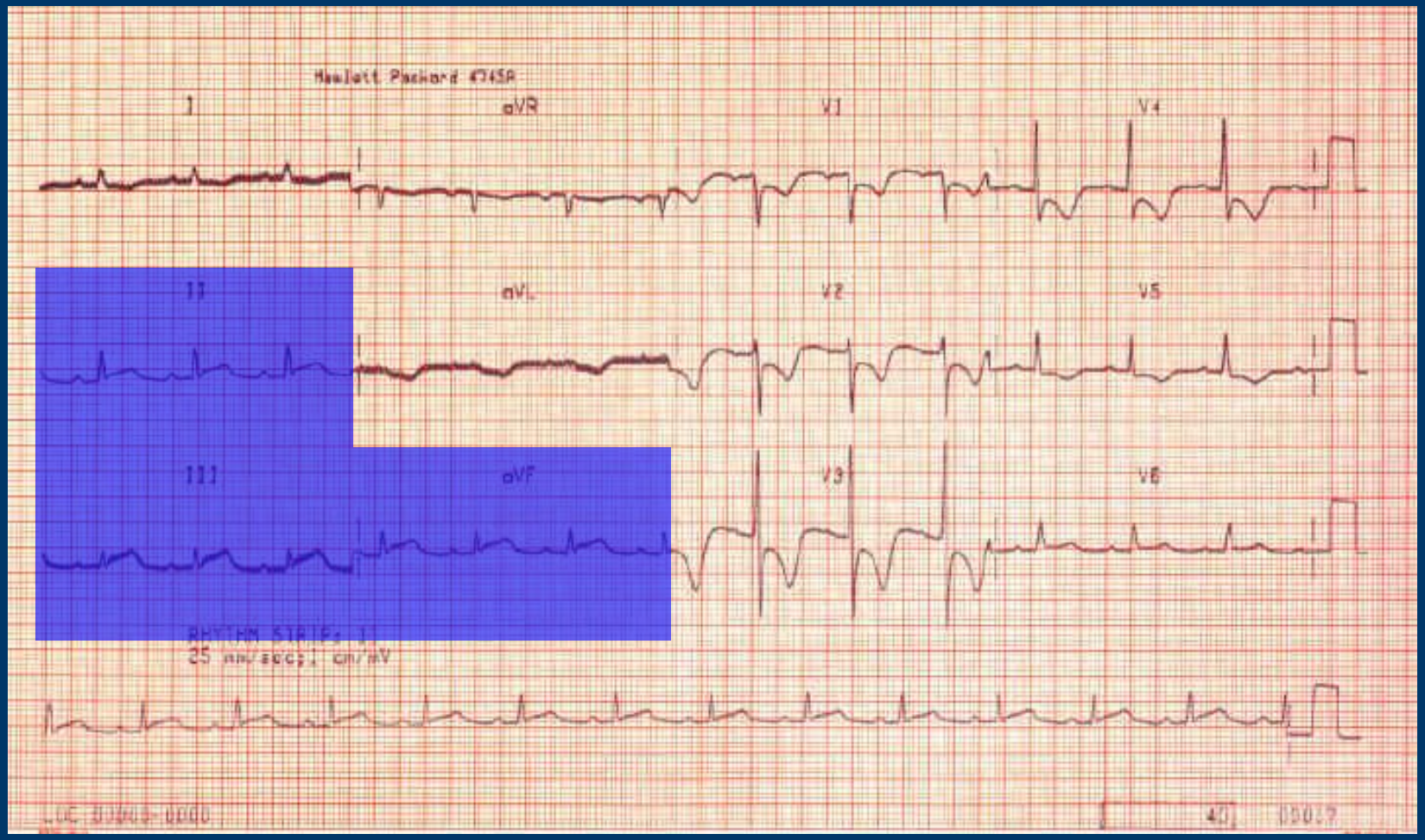
- An initial negative deflection is the Q wave
- There are normal Q waves such as is common in Lead II

Pathological Q wave

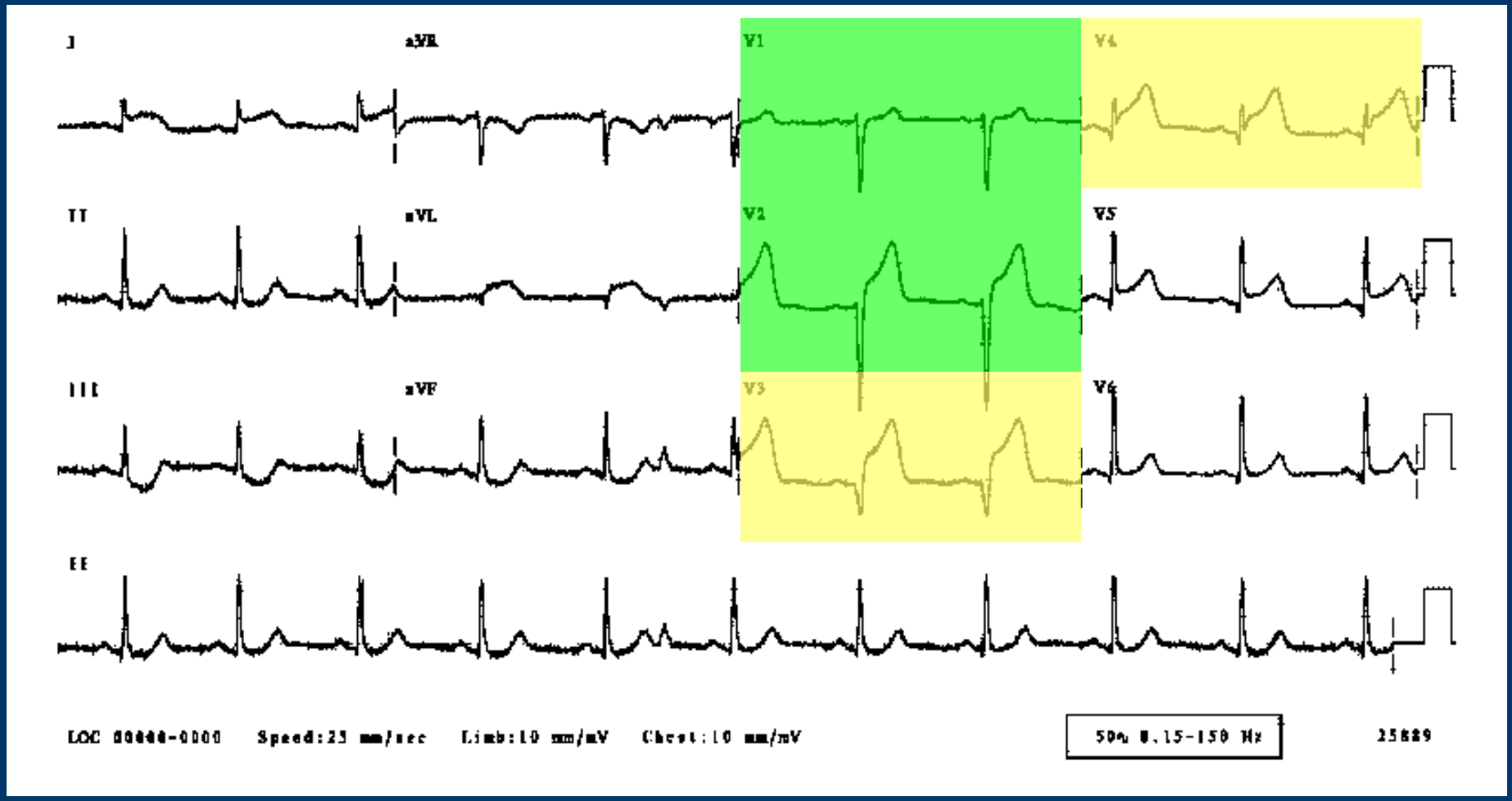
- A pathological Q wave must be:
  - 0.04 seconds wide
  - At least 1/3 the overall height of the QRS complex



Occlusion of right coronary artery


Hewlett Packard 4745A
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
RHYTHM STRIP: II
25 mm/sec; 1 cm/mV

Occlusion of the left anterior descending artery


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
LOC 00000-0000
Speed:25 mm/sec
Limb:10 mm/mV
Chest:10 mm/mV
50Hz 0.15-150 Hz
25829

Lateral MI


Occlusion of
left circumflex coronary artery,
marginal branch of left circumflex artery, or
diagonal branch of left anterior descending artery

Lateral MI

Method of Analyzing 12 lead ECG for Infarction

- Determine underlying rhythm
- Look at contigious leads
  - Inferior wall – II, III, aVF
  - Septal wall – V1, V2
  - Anterior wall – V3, V4
  - Lateral wall – I, aVL, V5, V6
- Look at T wave and ST changes
  - T wave
  - ST segment
  - Q waves

Ischemia & Infarction Case Review

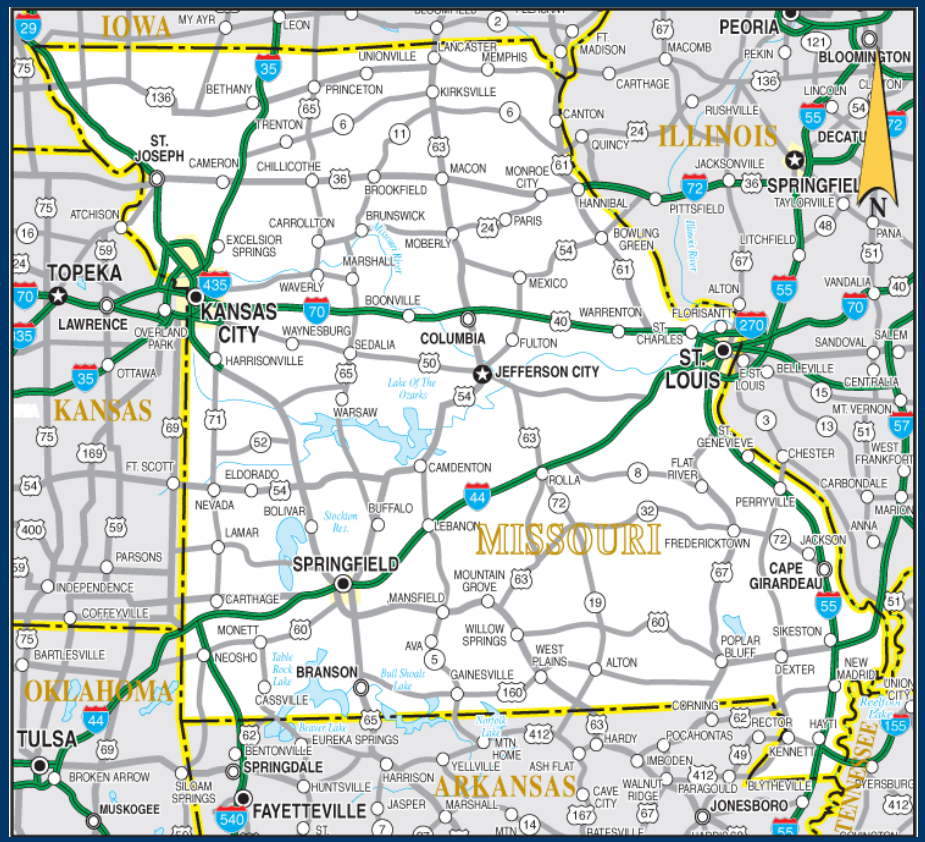
AXIS & VECTORS

Direction and Distance of Current

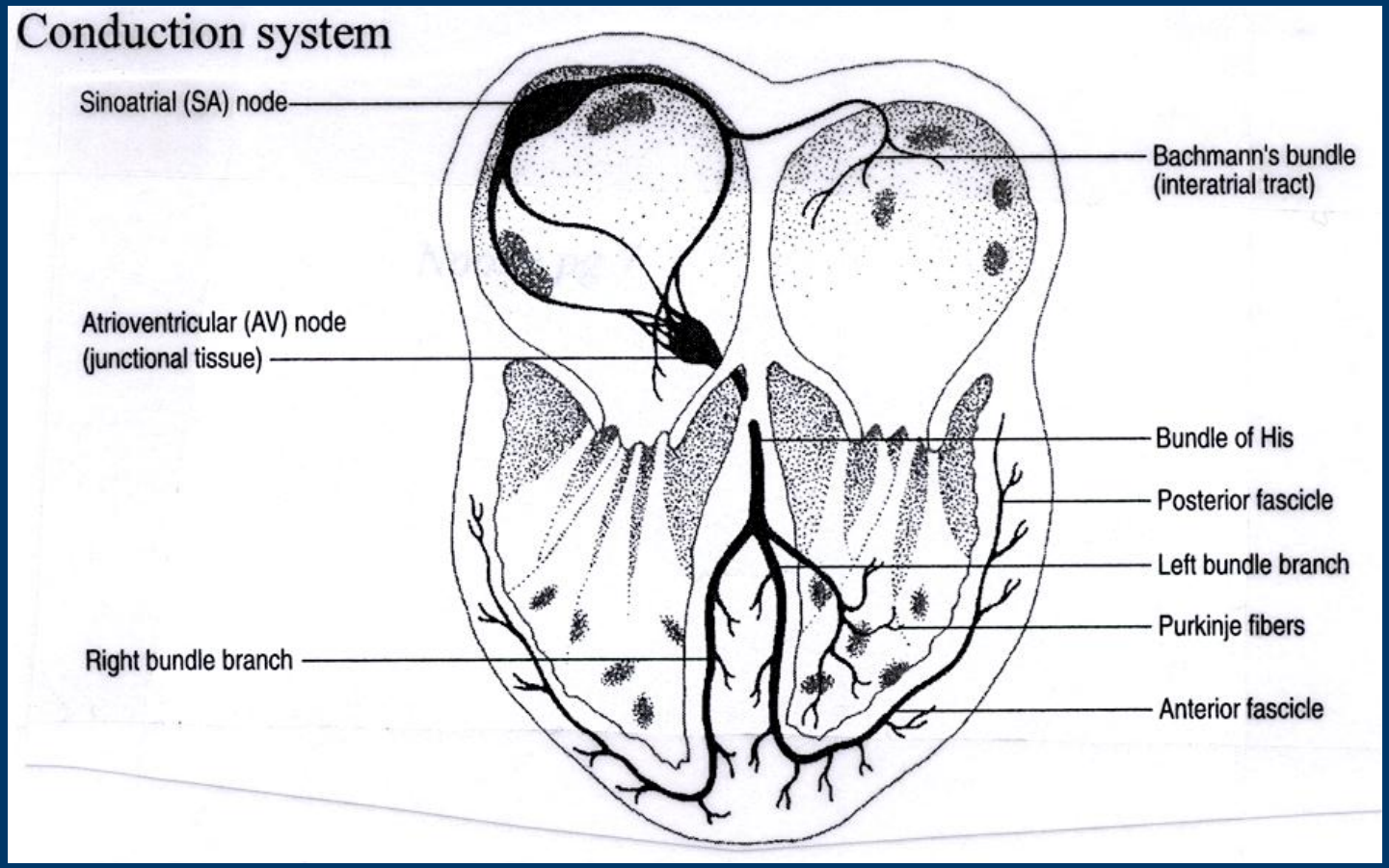
- Direction
  - Positive deflection
  - Negative deflection
- Distance
  - Height or depth of complex

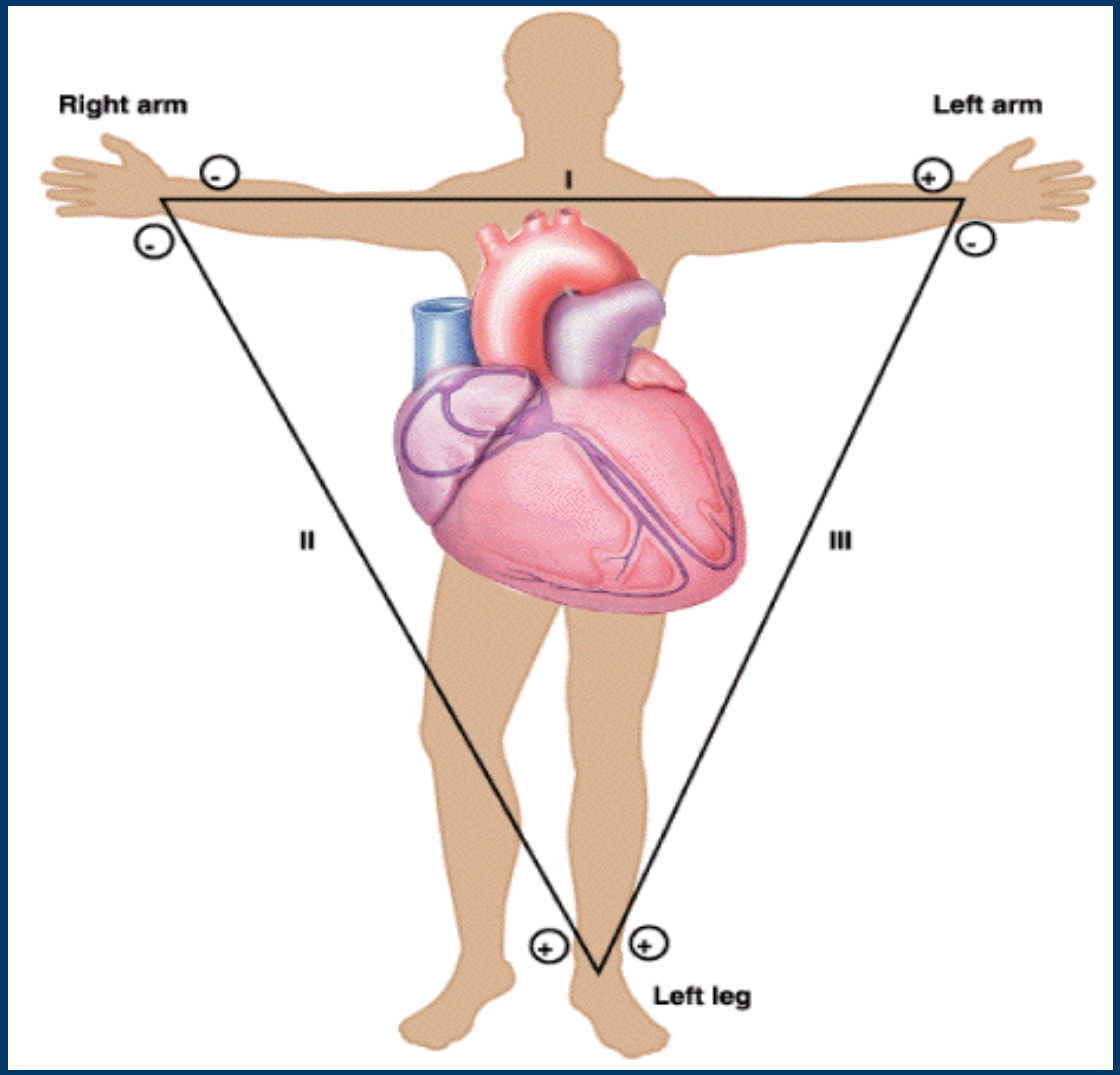
Vectors

- Describe the direction and the distance the electrical current travels



Normal Conduction

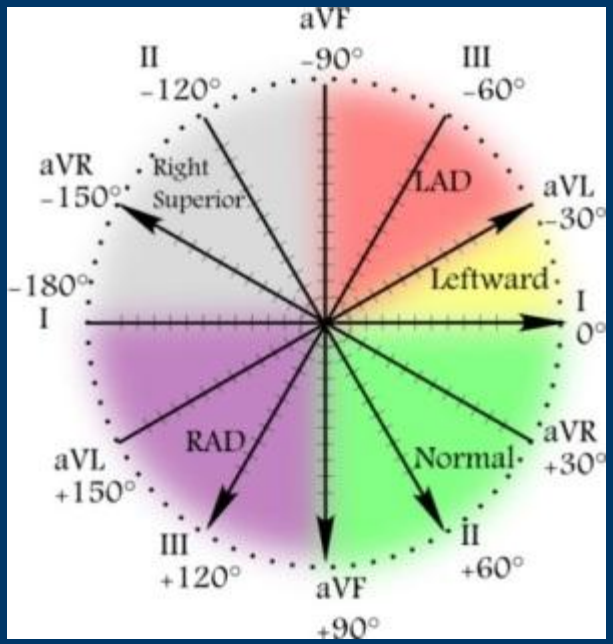



Right arm
Left arm
I
II
III
Left leg

Normal ECG Layout

I	aVR	V_1	V_4
II	aVL	V_2	V_5
III	aVF	V_3	V_6

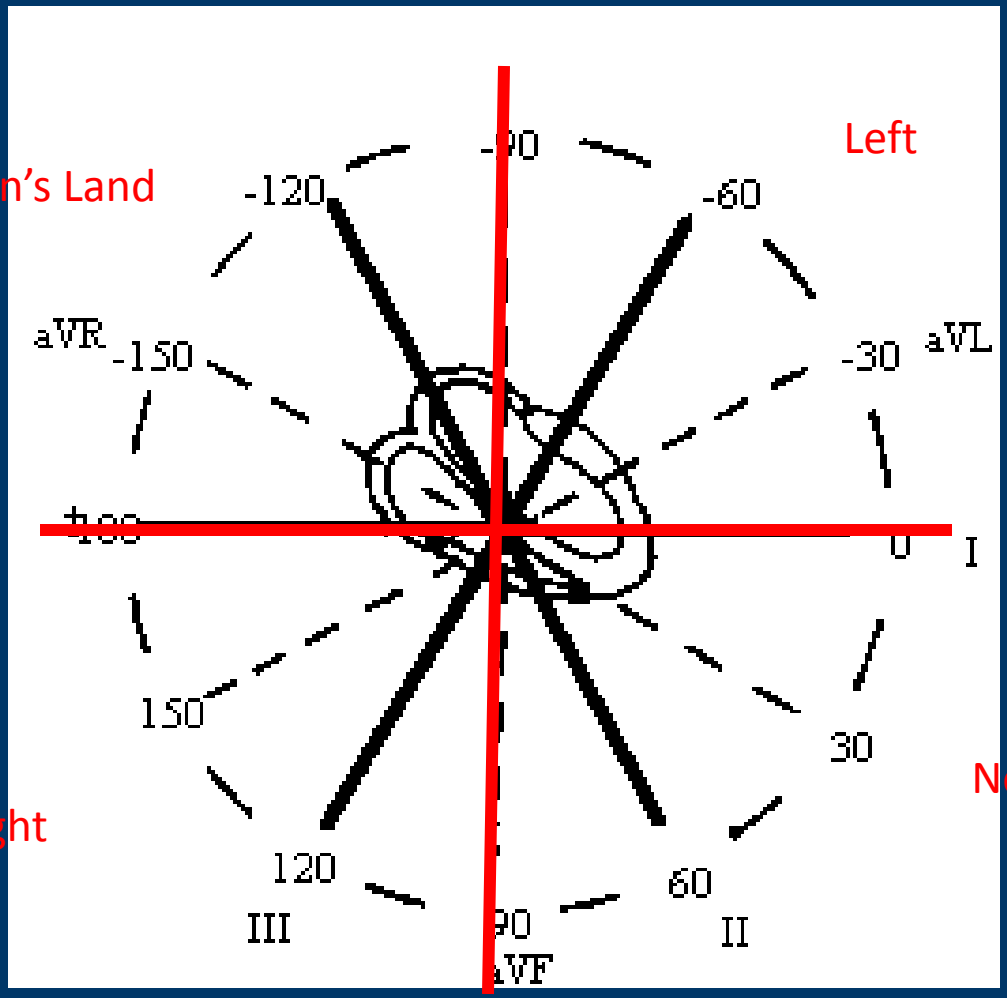
Axis Determination



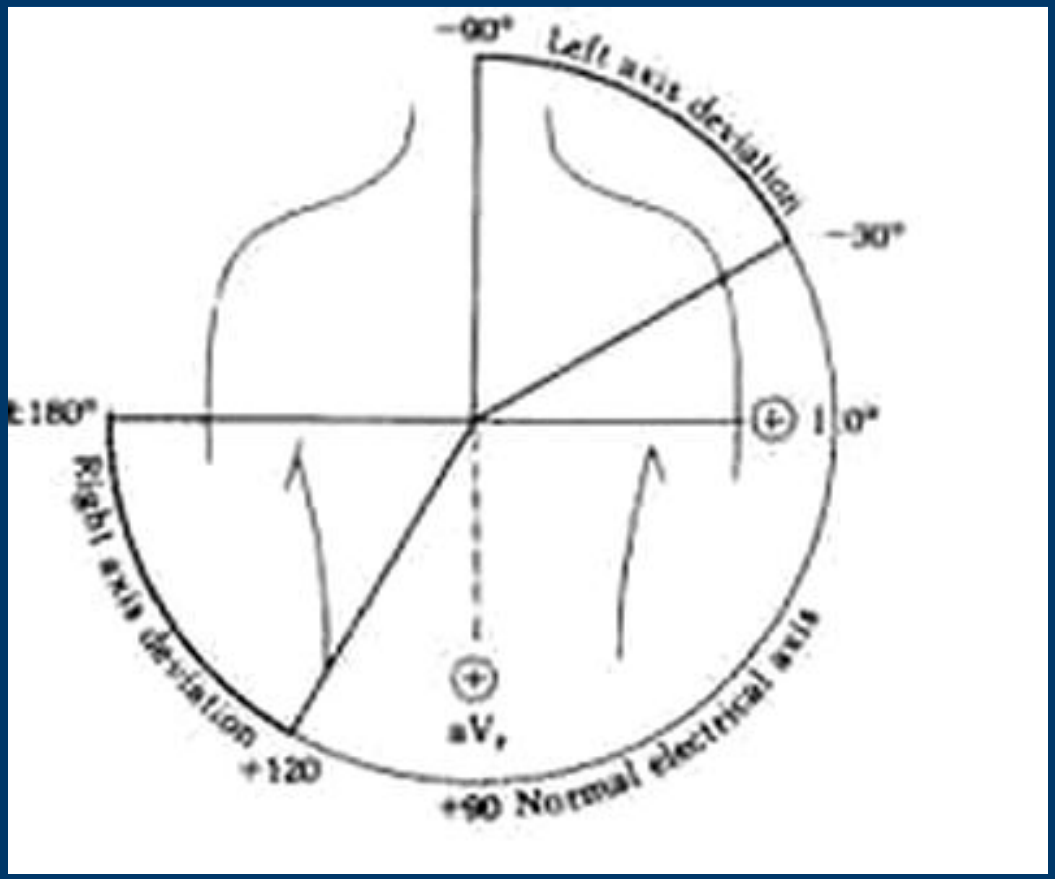
- Impulse flows from the top of the heart to the apex and from the inside of the muscle wall to the outside
- These impulses are vectors
- Vectors added together are called axis

Determining Axis

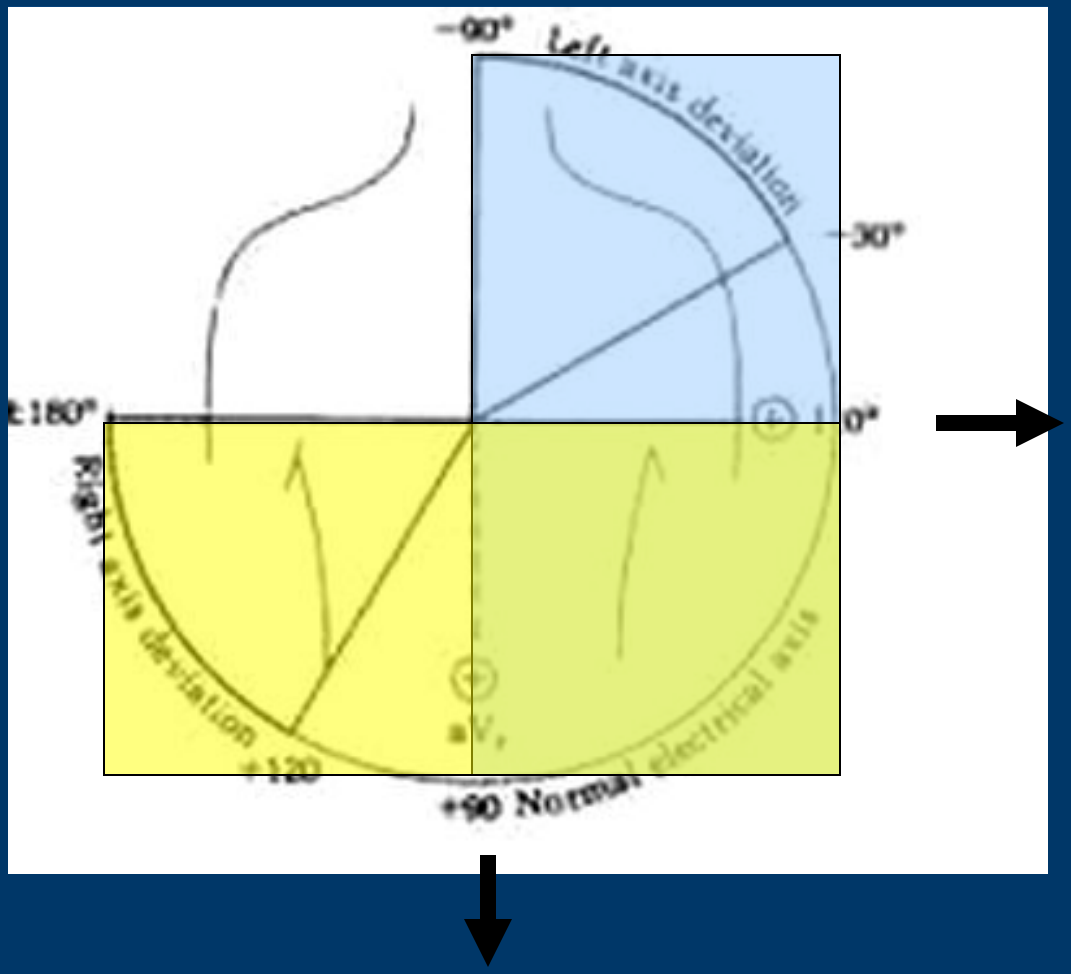
- Use only Leads I and aVF to divide the chest into 4 quadrants
  - Normal
  - Right deviation
  - Left deviation
  - Northwest or “No man’s land”
- Look at Leads I and aVF
  - Positive deflected
  - Negative deflected


Left
No Man's Land
-120
-60
aVR
-150
-30
aVL
0
I
150
30
Normal
Right
120
60
III
II
aVF

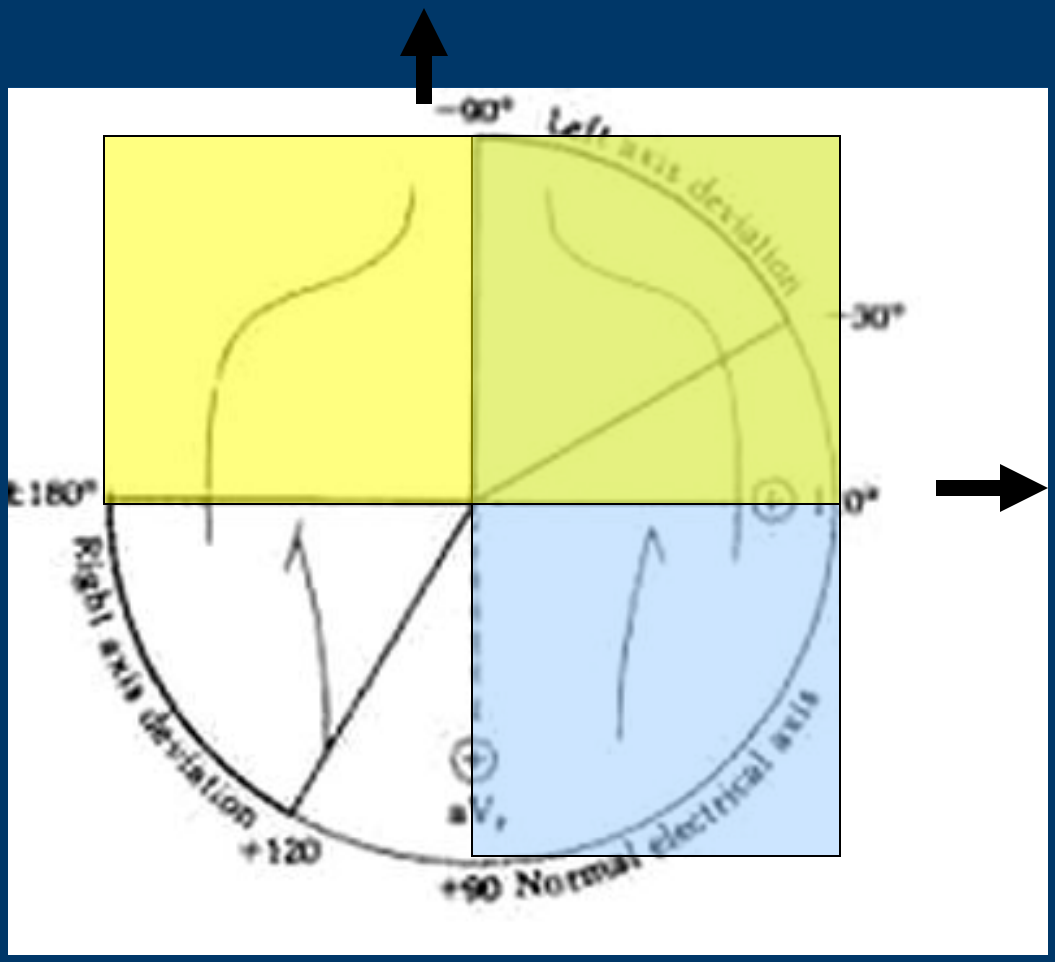
Axis Determination



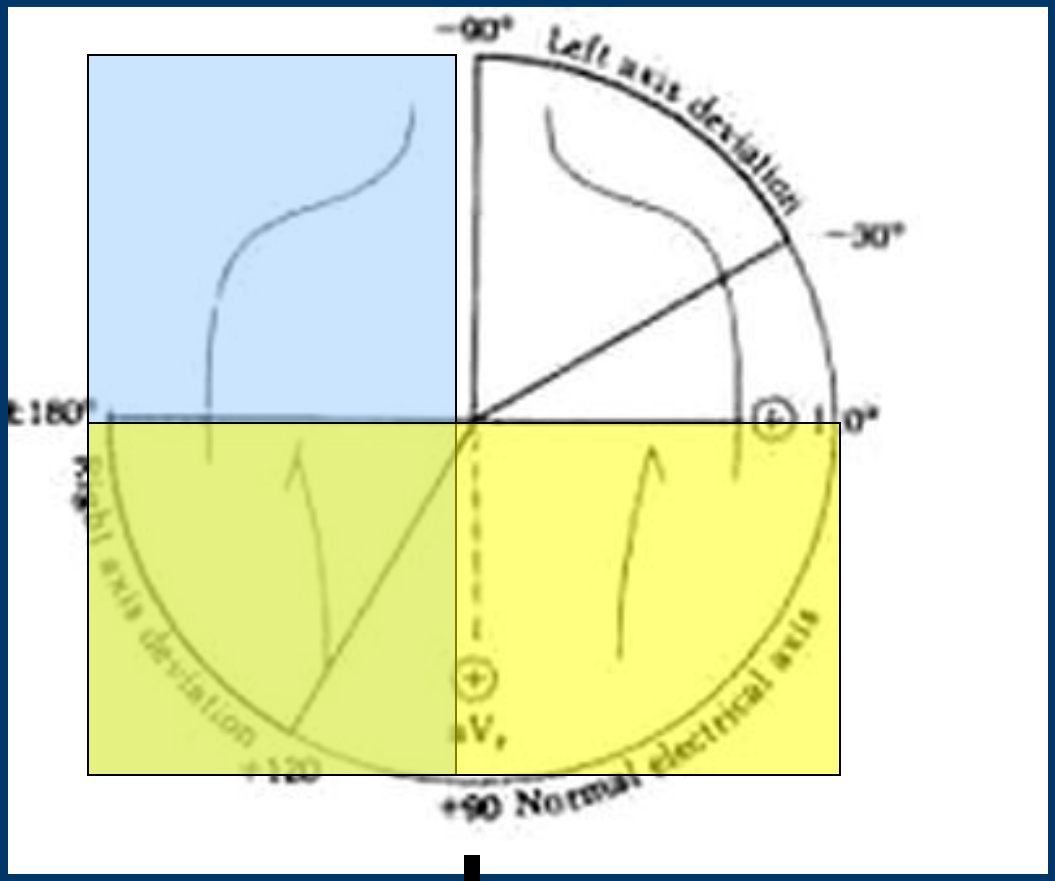
Normal Axis


-90°
Left axis deviation
-30°
±180°
0°
Right axis deviation
+120
+90 Normal electrical axis

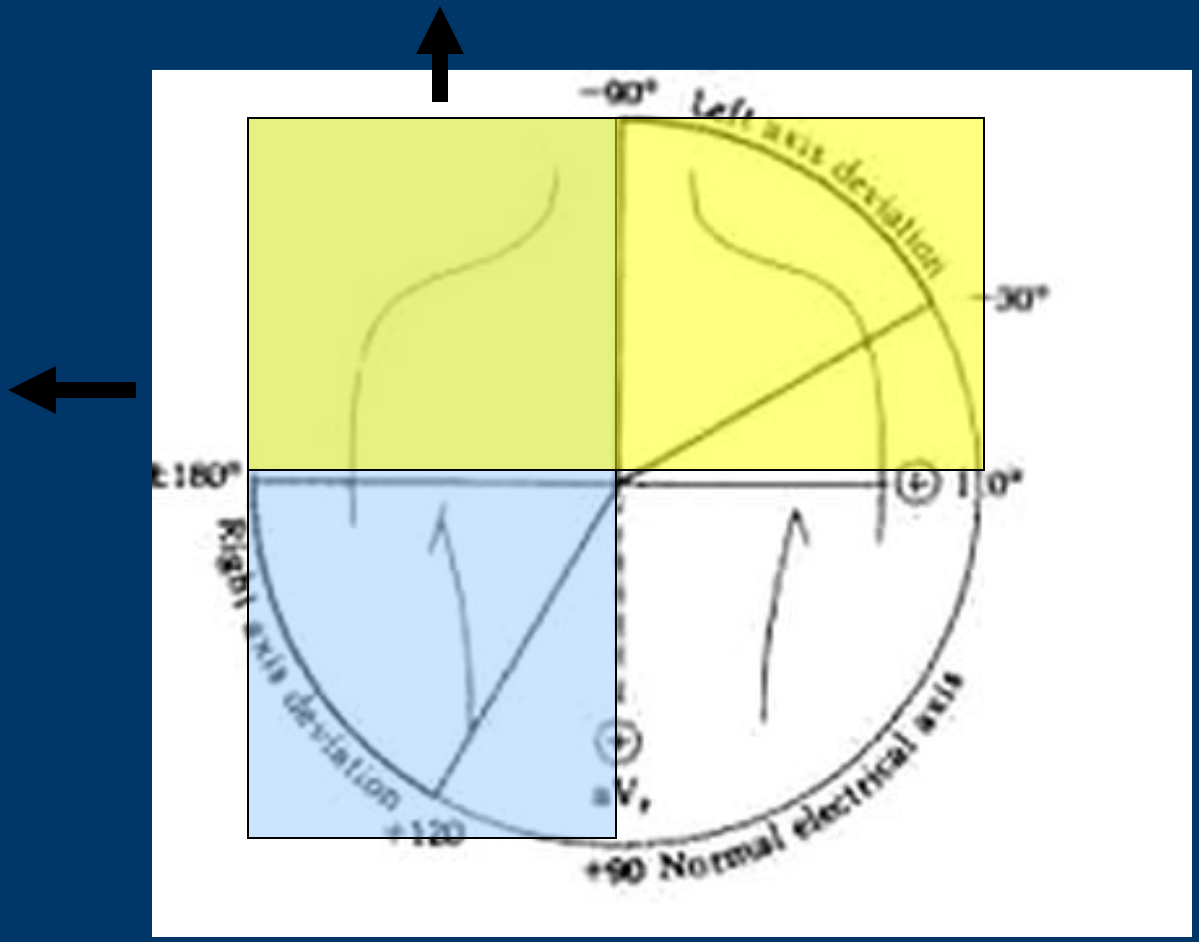
Left Axis Deviation



Right Axis Deviation



No Man's Land

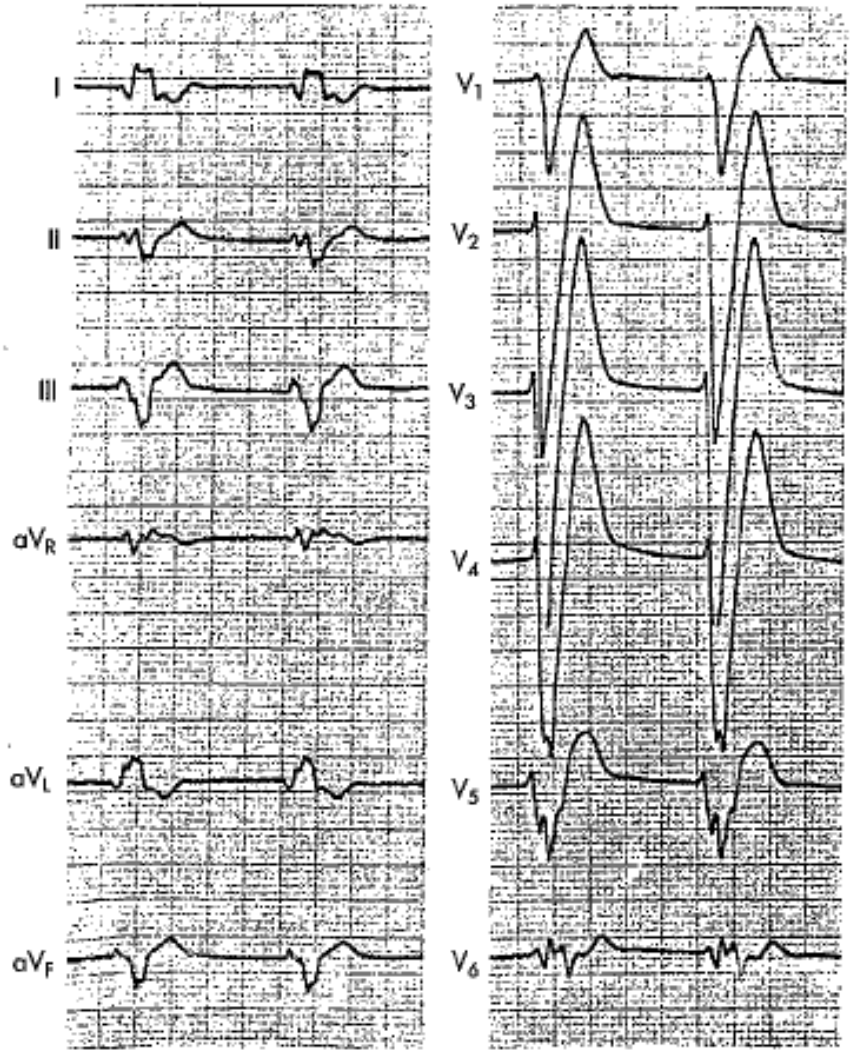

-90°
Left axis deviation
-30°
±180°
0°
Right axis deviation
+120
+90 Normal electrical axis

Calculating Axis Degrees

- Identify most upright QRS
- Identify deflection of perpendicular partners
  - Lead 1 & aVF
  - Lead 2 & aVL
  - Lead 3 & aVR
- Partner has positive deflection – move 30 degrees toward lead
- Partner has negative deflection – move 30 degrees away from lead

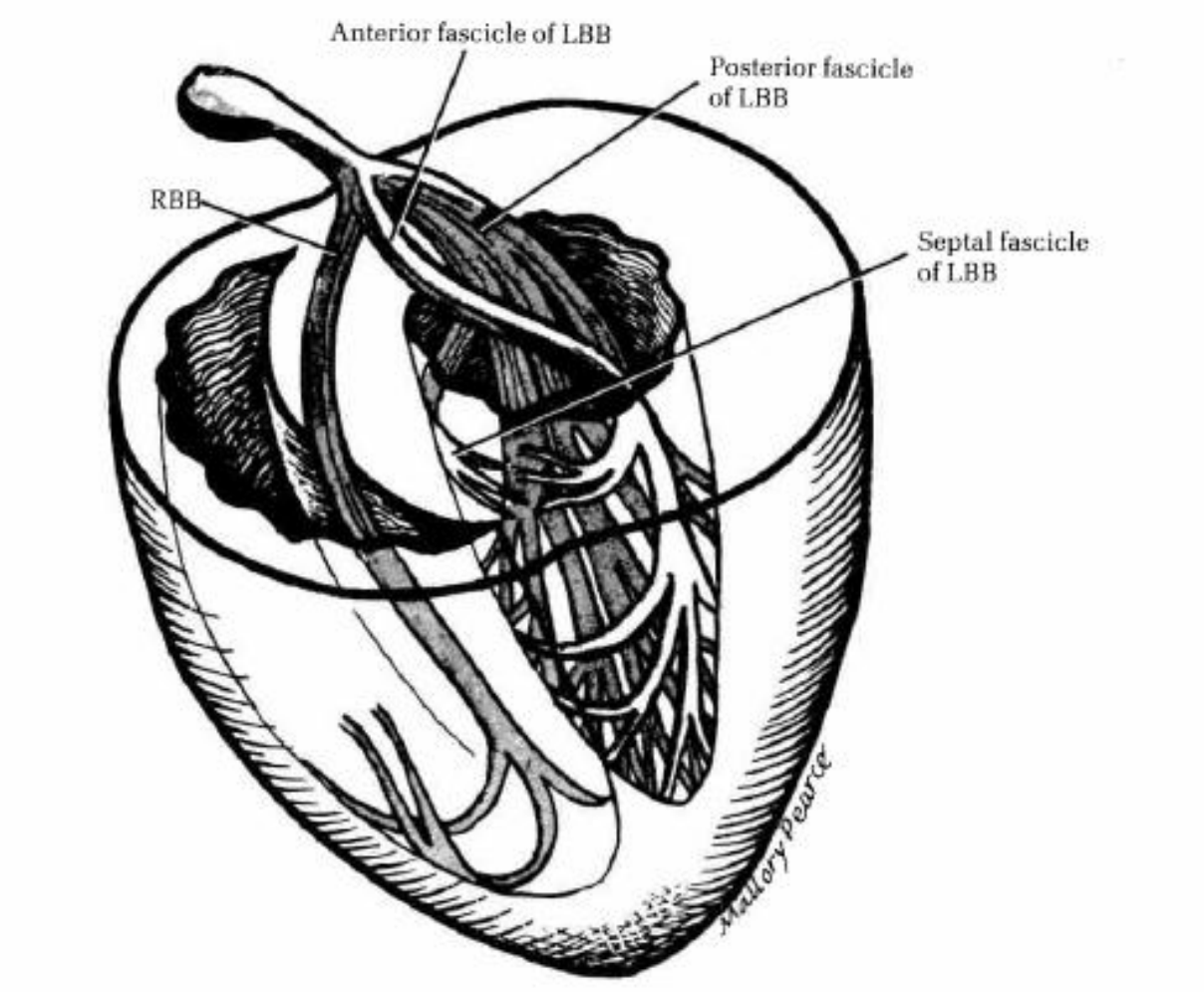
Axis Case Review

4. Case Study -- 50 year old male post PCI. He appears fatigued. His color is grayish and sallow. His wife reports general loss of appetite, loss of motivation. Patient reports general malaise. Vital signs are stable. Heart rate is bradycardic. 12 lead EKG shows the following.

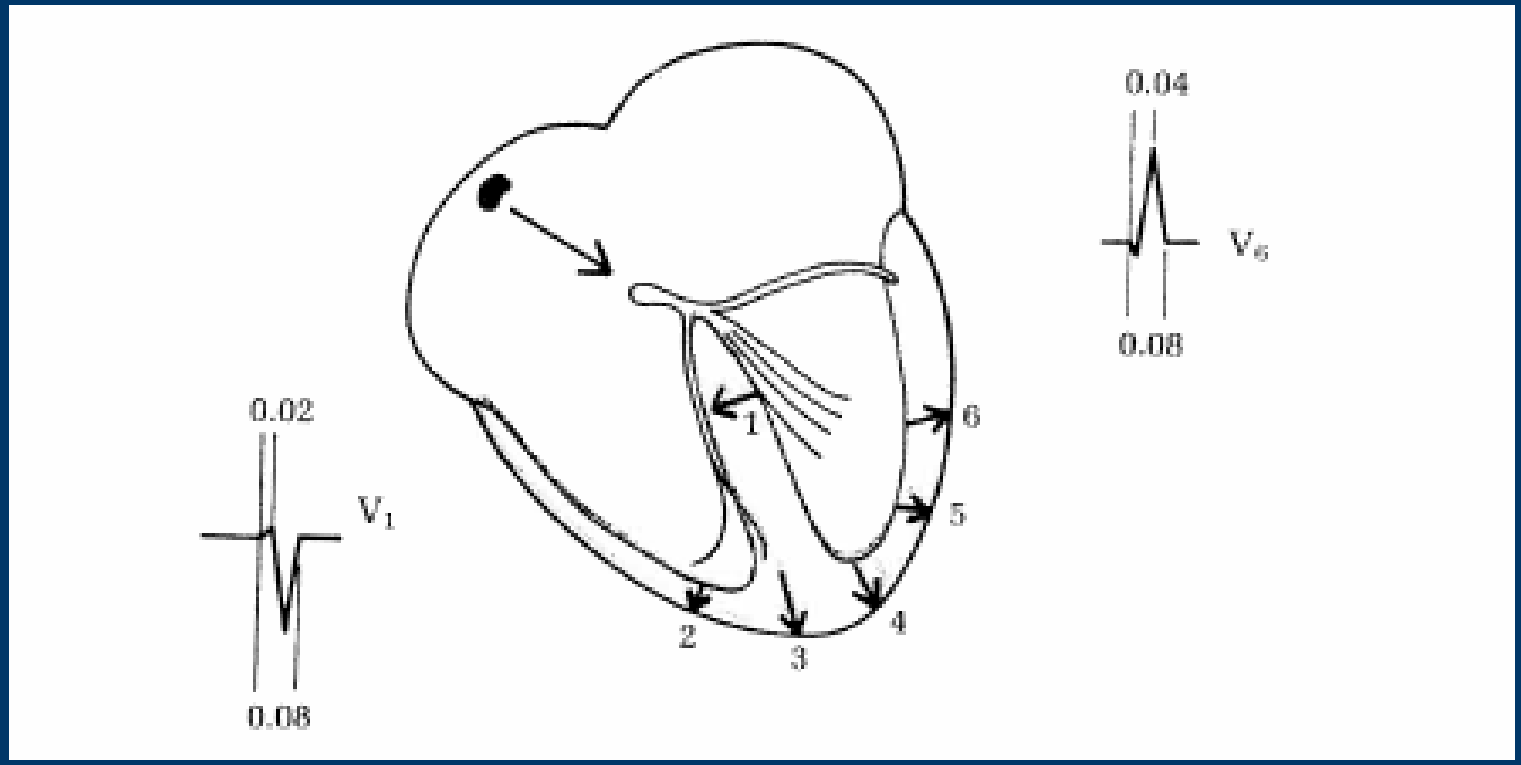


BUNDLE BRANCH BLOCKS

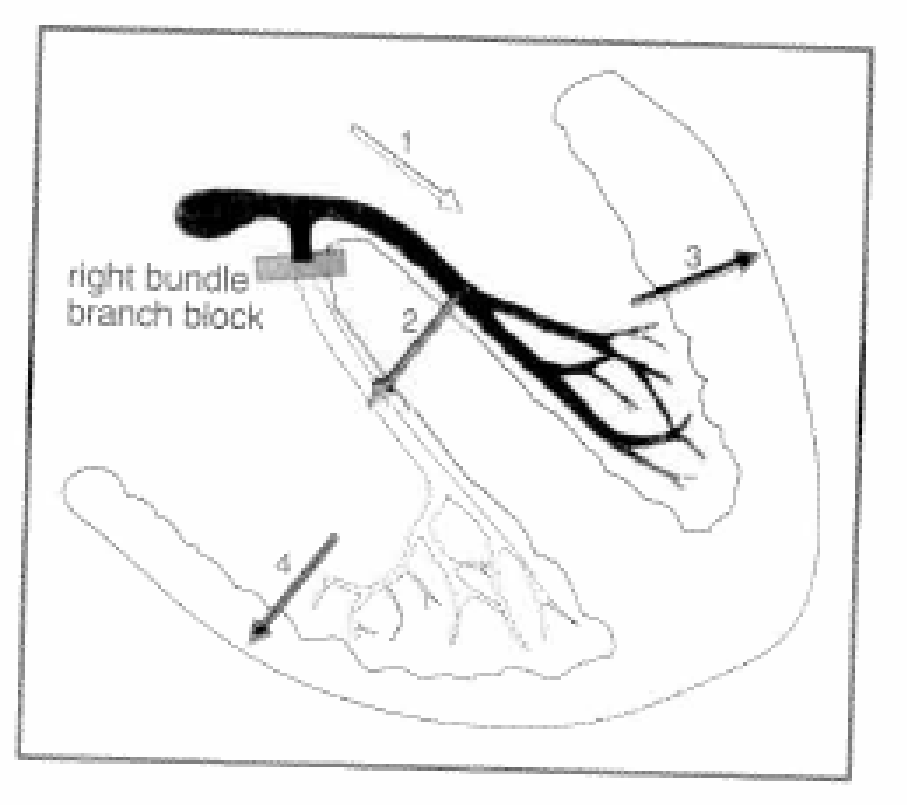
Structure of Bundle Branches



Normal Bundle Conduction

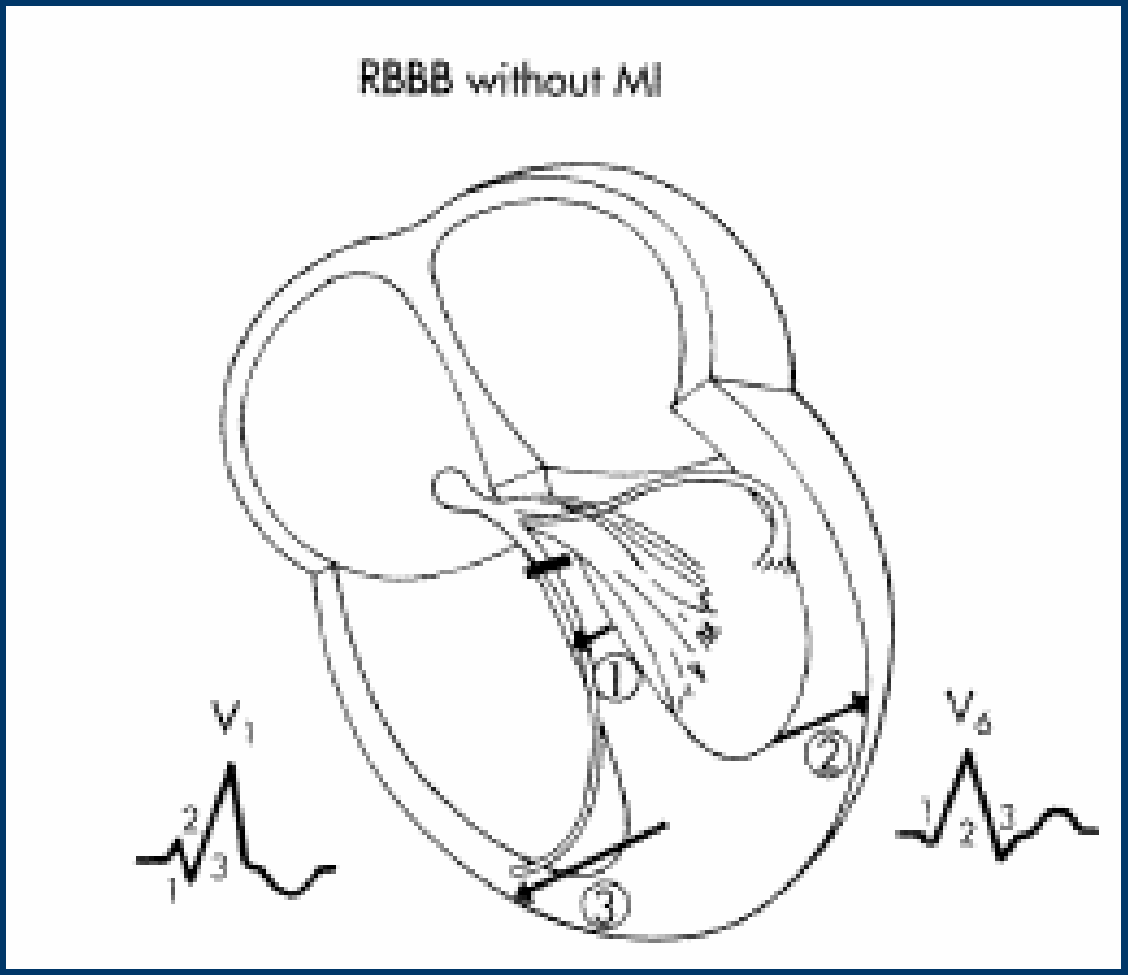


Right Bundle Branch Block

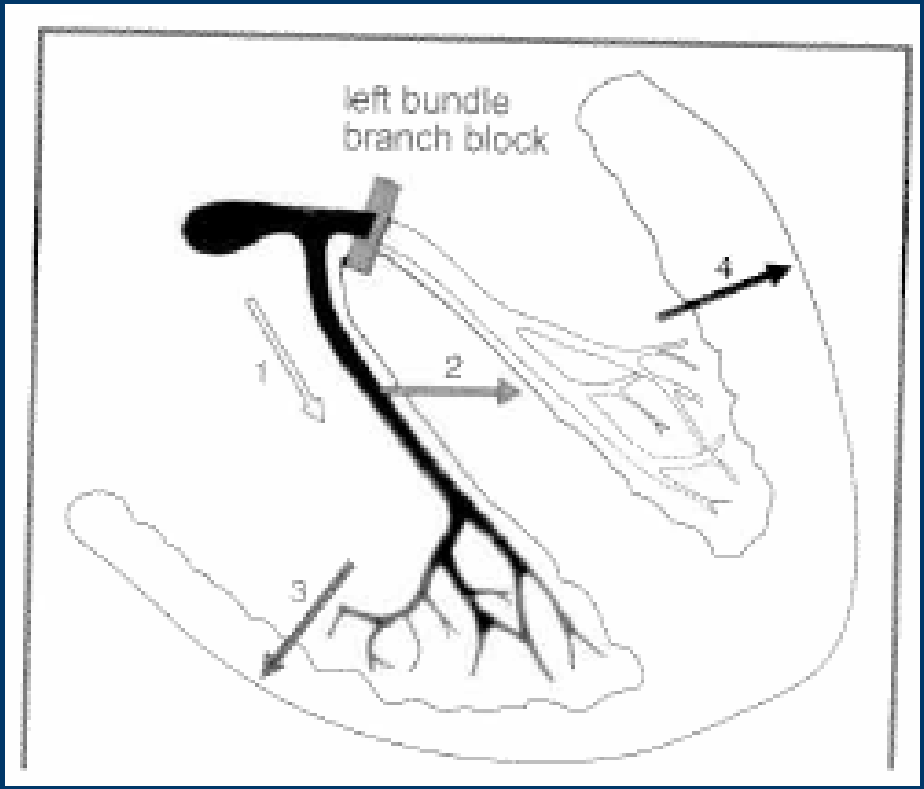


Right Bundle Branch Block

- What 2 leads should be used to assess BBB?
- What is the QRS deflection in V1 with normal conduction?
- What is the QRS deflection in V1 with RBBB?
- What is the classic QRS pattern in RBBB?

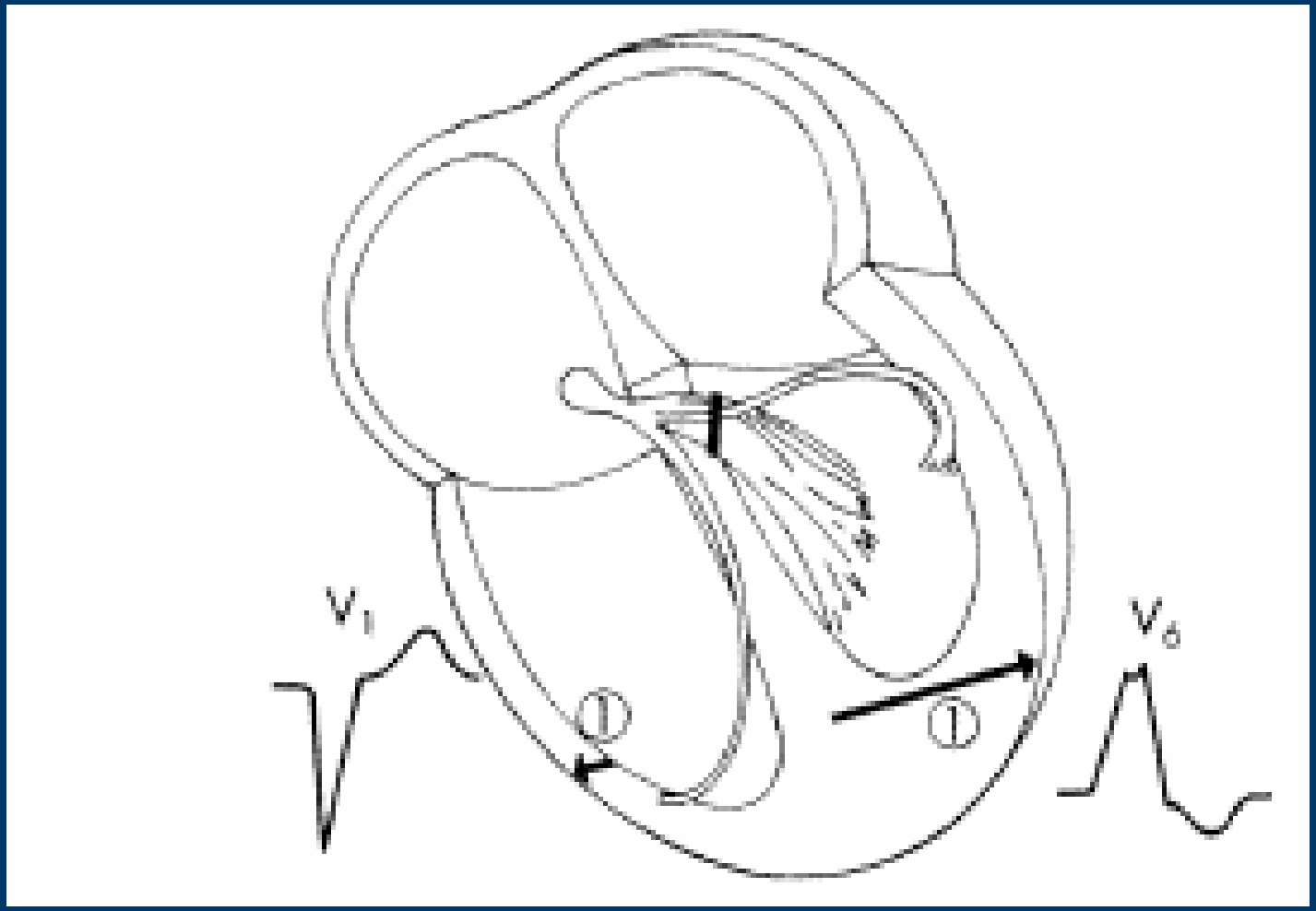

RBBB without MI
V1
1
2
3
V6
1
2
3
1
2
3

Left Bundle Branch Block

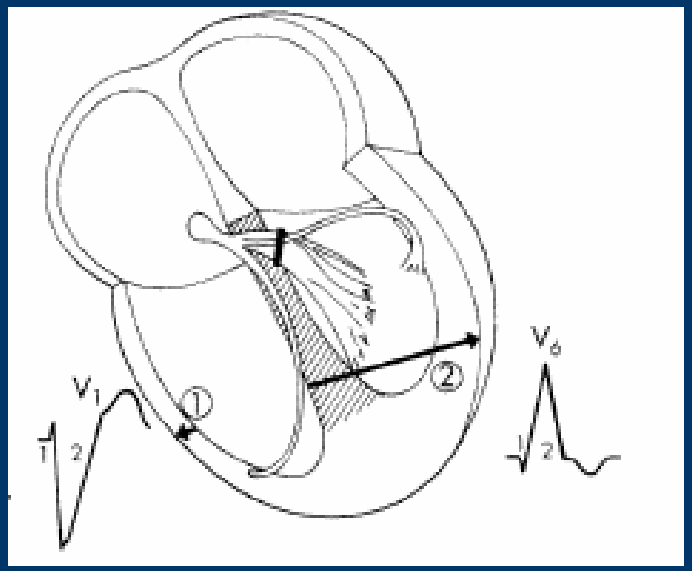


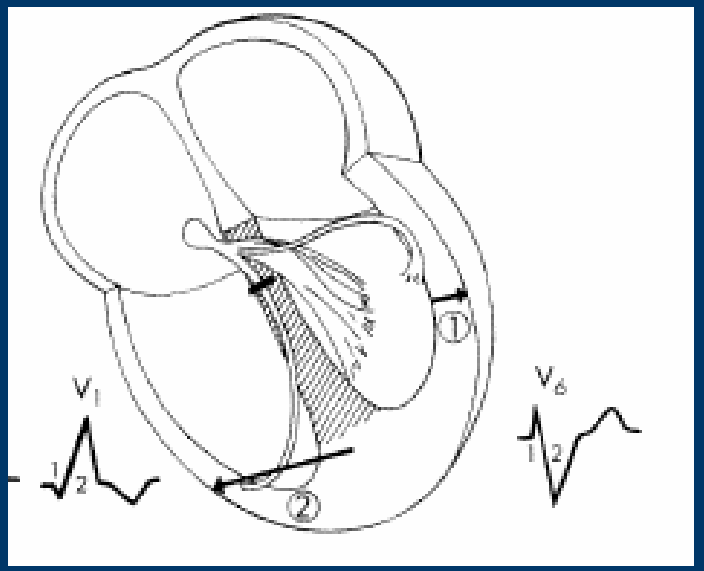
Left Bundle Branch Block

- How is the septum depolarized? From right to left or left to right?
- Does this change with LBBB?
- What changes occur in V1 and V6 with LBBB?


V_I
V_O

Change in BBB Pattern in MI





Bundle Branch Block Case Review

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